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Height-age Curves for Austrian Pine in Windbreaks
on Loess Soils of NebraskaD. H. Sander¹

Austrian pine (*Pinus nigra austriaca*, Schneid) is an important component of many Nebraska windbreaks. This species is relatively fast growing, provides good windbreak density in both summer and winter, and is relatively free of insects and diseases.

This note reports the heights that Austrian pines have attained at different ages on a range of sites, and a means of rating site capability or site quality.

Study methods were similar to those previously used for ponderosa pine.² Tree heights at 2-year intervals were obtained by measuring internodes along the entire stem of each tree. Only dominant trees that were free to grow and represent maximum site potential were measured. No suppressed or otherwise damaged trees were used. Heights were plotted against ages for each tree, and the resulting family of growth curves was smoothed by regression methods. Site capability was expressed as height at 20 years of age (fig. 1).

Five trees were sampled on each site, except for one site with low site capability and one site in the 54-year age class. Trees sampled by age classes were:

Age class (Years)	Trees (Number)	Sites (Number)
6 to 20	99	21
22	59	13
26 to 30	16	4
34 to 54	11	3

Sampling sites were well distributed throughout the Loess Plains region of Nebraska. Trees that had been planted 22 years or less were sampled in field windbreaks. Older pines (26 to 54 years) were sampled from farmstead windbreaks.

Figure 1 shows the smoothed curves up to age 54. The data indicate Austrian pine grows relatively rapidly during the first 20 years after planting--approximately 1 foot per year on the average site. The growth rate decreased 0.025 foot per year on the average site, which results in a growth rate of only 0.2 to 0.3 foot per year 50 years after planting.

The height growth of Austrian pine in the Loess Plains of Nebraska compares favorably with height growth in Europe up to age 50 years. According to Petri,³ total height of

Austrian pine growing in the Rheinland-Pfalz is quite similar at 50 years of age to that attained in Nebraska. Height growth in Europe was slower, however, during the early years, and faster after 40 to 50 years. Petri's data were based on 21 Austrian pine provenances sampled on a variety of sites.

The curves are fairly accurate for predicting site capability and future height of windbreak trees. Statistical errors are of two kinds: (1) the error inherent in smoothing height-age curves or the failure of all trees to conform to a uniform curve, and (2) the error involved in measuring trees in the field due to variability in tree heights. The error in predicting site capability or total height reduces from ± 5.4 feet at 6 years to ± 0.9 foot at 18 years with a five-tree sample. The small

sample size for ages 30 through 54 prevented accurate evaluation of the error in that age range. Sample data, however, fit the curves well.

¹ Soil Scientist, located at the Station's project headquarters at Lincoln in cooperation with the University of Nebraska; central headquarters are maintained at Fort Collins in cooperation with Colorado State University.

² Sander, D. H. Growth curves for ponderosa pine in Nebraska windbreaks. U. S. Forest Serv. Rocky Mountain Forest and Range Expt. Sta. Res. Note 82, 3 pp., illus. 1962.

³ Petri, H. Wachstumsverhältnisse der Schwarzkiefer im nördlichen Rheinland-Pfalz. Forstarchiv 32 (10), (201-6). 16 refs. 1961.

Figure 1.--
Height-age curves
for Austrian pines
in Nebraska wind-
breaks. Site capa-
bility is expressed
as height in feet
at 20 years after
planting.

